

CLAIMS

What is claimed is:

- 5 1. A formulation for use in neutralization of a toxant, said formulation comprising:
- at least two solubilizing compounds, wherein at least one solubilizing compound is a
 cationic surfactant and at least one solubilizing compound is a cationic
 hydrotrope;
- a reactive compound comprising one or more compounds selected from the group
10 consisting of hydrogen peroxide, urea hydrogen peroxide,
 hydroperoxycarbonate, peracetic acid, sodium perborate, sodium
 peroxypyrophosphate, sodium peroxysilicate, and sodium percarbonate;
- a bleaching activator selected from the group consisting of O-acetyl, N-acetyl, and
 nitrile group bleaching activators; and
- 15 a sorbent additive;
- wherein said at least two solubilizing compounds, said reactive compound, said
 bleaching activator, and said sorbent additive, when mixed with water and
 exposed to the toxant, neutralizes the toxant.
- 20 2. The formulation according to claim 1, wherein said cationic surfactant comprises a
 quaternary ammonium salt selected from the group consisting of cetyltrimethyl ammonium
 bromide, benzalkonium chloride, benzethonium chloride, cetylpyridinium chloride,
 alkyldimethylbenzylammonium salt, tetrabutyl ammonium bromide, and WITCO VARIQUAT
 80MC™, and combinations thereof.

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3. The formulation according to claim 1, further comprising a water-soluble polymer selected from the group consisting of polyvinyl alcohol, guar gum, (cationic or non-ionic) polydiallyl dimethyl ammonium chloride, polyacrylamide, poly (ethylene oxide), glycerol, polyethylene glycol 8000 (PEG 8000), and JAGUAR 8000™ (Guar Gum 2-hydroxypropyl ether), and combinations thereof.

4. The formulation according to claim 1, further comprising a fatty alcohol comprising from 8 to 20 carbon atoms per molecule.

5. The formulation according to claim 1, further comprising a solvent selected from the group consisting of Di(propylene glycol) methyl ether, diethylene glycol monobutyl ether, and combinations thereof.

6. The formulation according to claim 1, further comprising a carbonate salt selected from the group consisting of potassium bicarbonate, sodium bicarbonate, ammonium bicarbonate, ammonium hydrogen bicarbonate, lithium bicarbonate, ammonium carbonate, and potassium carbonate, and combinations thereof.

7. The formulation according to claim 1, wherein said bleaching activator comprises one or more water-soluble bleaching activators selected from the group consisting of acetylcholine chloride, monoacetin (glycerol monoacetate), diacetin (glycerol diacetate), 4-cyanobenzoic acid, ethylene glycol diacetate, propylene glycol monomethyl ether acetate, methyl acetate, dimethyl glutarate, diethylene glycol monoethyl ether acetate, glycerol diacetate (Diacetin), glycerol monoacetate, glycerol triacetate, and propylene glycol diacetate, and combinations thereof.

8. The formulation according to claim 1, wherein said bleaching activator comprises one or more water-insoluble bleaching activators selected from the group consisting of tetraacetyl ethylenediamine (TAED), n-nonanoyloxybenzenesulfonate (NOBS), and N-acetyl glucosamine, and combinations thereof.

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9. The formulation according to claim 1 consisting substantially of:

1-10% benzalkonium chloride;

1-8% propylene glycol diacetate or glycerol diacetate;

1-16% hydrogen peroxide;

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2-8% potassium bicarbonate;

a sufficient amount of sorbent additive, such that a freely flowing powder results when the sufficient amount of sorbent additive is mixed with the 1-8% propylene glycol diacetate or glycerol diacetate; and

balance water.

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10. The formulation of claim 1, wherein said sorbent additive comprises one or more compounds selected from the group consisting of sodium hexa meta phosphate, sodium ortho phosphate, sodium mono hydrogen ortho phosphate, sodium acid pyro phosphate, sodium tri-polyphosphate, sodium sulfate, sodium carbonate, sodium bicarbonate, calcium meta phosphate, calcium hypo chlorite, calcium chloride, calcium carbonate, potassium bicarbonate, potassium bromide, potassium carbonate, zeolytes, precipitated silicas, percarbonates, sodium citrate, dendritic salt (sea salt), citric acid, potassium bromide, polyethylene glycols, PEG 8000, urea, and polyols, and combinations thereof.

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11. The formulation of claim 1, wherein said sorbent additive comprises one or more polyol compounds selected from the group consisting of sorbitol, mannitol, HSH, maltitol, zylitol, lactitol monohydrate, anhydrous isomalt, erythritol, and polydextrose, and combinations thereof.

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12. The formulation according to claim 1 packaged in a kit configuration, wherein said kit configuration comprises:

a premixed first component comprising said at least two solubilizing agents;

a second component comprising said reactive compound; and

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a premixed third component comprising said bleaching activator mixed with a sufficient amount of said sorbent additive such that the mixture of bleaching activator plus sorbent additive is a freely flowing powdered substance.

13. The formulation according to claim 12 further comprising make-up water.

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14. The formulation according to claim 12 wherein said premixed first component additionally comprises a water-soluble polymer.

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15. The formulation according to claim 12 wherein said bleaching activator is selected from the group consisting of propylene glycol diacetate, glycerol diacetate, and combinations thereof.

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16. The formulation according to claim 12 wherein said reactive compound comprises urea hydrogen peroxide; and further wherein said second component additionally comprises sodium percarbonate.

17. A formulation for use in neutralization of a toxant, said formulation comprising:

a cationic surfactant;

a reactive compound comprising one or more compounds selected from the group consisting of hydrogen peroxide, urea hydrogen peroxide, hydroperoxycarbonate, peracetic acid, sodium perborate, sodium peroxyphosphate, sodium peroxysilicate, and sodium percarbonate;

a bleaching activator selected from the group consisting of O-acetyl, N-acetyl, and nitrile group bleaching activators;

a sorbent additive; and

a carbonate salt, not one of the reactive compounds;

wherein said cationic surfactant, said reactive compound, said bleaching activator, said sorbent additive, and said carbonate salt, when mixed with water and exposed to the toxant, neutralizes the toxant.

18. The formulation according to claim 17, wherein said cationic surfactant comprises a quaternary ammonium salt comprising benzalkonium chloride.

19. The formulation according to claim 17, wherein said carbonate salt comprises one or more compounds selected from the group consisting potassium bicarbonate, sodium bicarbonate, ammonium bicarbonate, ammonium hydrogen bicarbonate, lithium bicarbonate, ammonium carbonate, and potassium carbonate, and combinations thereof.

20. The formulation according to claim 17 consisting substantially of said cationic surfactant, said reactive compound, said bleaching activator, said sorbent additive, and said carbonate salt.

21. The formulation according to claim 17, wherein said bleaching activator comprises one or more water-soluble bleaching activators selected from the group consisting of acetylcholine

chloride, monoacetin (glycerol monoacetate), diacetin (glycerol diacetate), 4-cyanobenzoic acid, ethylene glycol diacetate, propylene glycol monomethyl ether acetate, methyl acetate, dimethyl glutarate, diethylene glycol monoethyl ether acetate, glycerol diacetate (Diacetin), glycerol monoacetate, glycerol triacetate, and propylene glycol diacetate, and combinations thereof.

22. The formulation according to claim 17 packaged in a kit configuration, wherein said kit configuration comprises:

a premixed first component comprising said cationic surfactant;

a second component comprising said reactive compound; and

a premixed third component comprising said bleaching activator mixed with a sufficient amount of said sorbent additive such that the mixture of bleaching activator plus sorbent additive is a freely flowing powdered substance.

23. The formulation according to claim 22, wherein said premixed first component additionally comprises said carbonate salt.

24. The formulation according to claim 22, wherein said second component additionally comprises said carbonate salt.

25. The formulation of claim 17, wherein said sorbent additive comprises one or more compounds selected from the group consisting of sodium hexa meta phosphate, sodium ortho phosphate, sodium mono hydrogen ortho phosphate, sodium acid pyro phosphate, sodium tri-polyphosphate, sodium sulfate, sodium carbonate, sodium bicarbonate, calcium meta phosphate, calcium hypo chlorite, calcium chloride, calcium carbonate, potassium bicarbonate, potassium bromide, potassium carbonate, zeolytes, precipitated silicas, percarbonates, sodium citrate, dendritic salt (sea salt), citric acid, potassium bromide, polyethylene glycols, PEG 8000, urea, and polyols, and combinations thereof.

26. The formulation of claim 17, wherein said sorbent additive comprises one or more polyol compounds selected from the group consisting of sorbitol, mannitol, HSH, maltitol, zylitol, lactitol monohydrate, anhydrous isomalt, erythritol, and polydextrose, and combinations thereof.

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27. A formulation for use in neutralization of a toxant, said formulation comprising:

a cationic surfactant;

a reactive compound comprising one or more compounds selected from the group consisting of hydrogen peroxide, urea hydrogen peroxide, hydroperoxycarbonate, peracetic acid, sodium perborate, sodium peroxyphosphate, sodium peroxysilicate, and sodium percarbonate;

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a sorbent additive; and

a water-soluble bleaching activator selected from the group consisting of O-acetyl, N-acetyl, and nitrile group bleaching activators;

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wherein said cationic surfactant, said reactive compound, said sorbent additive, and said water-soluble bleaching activator, when mixed with water and exposed to the toxant, neutralizes the toxant.

28. The formulation according to claim 27, wherein said water-soluble bleaching activator comprises one or more compounds selected from the group consisting of acetylcholine chloride, monoacetin (glycerol monoacetate), diacetin (glycerol diacetate), 4-cyanobenzoic acid, ethylene glycol diacetate, propylene glycol monomethyl ether acetate, methyl acetate, dimethyl glutarate, diethylene glycol monoethyl ether acetate, glycerol diacetate (Diacetin), glycerol monoacetate, glycerol triacetate, and propylene glycol diacetate, and combinations thereof.

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29. The formulation according to claim 27, wherein said cationic surfactant comprises a quaternary ammonium salt comprising benzalkonium chloride.

30. The formulation according to claim 27, further comprising one or more carbonate salts selected from the group consisting potassium bicarbonate, sodium bicarbonate, ammonium bicarbonate, ammonium hydrogen bicarbonate, lithium bicarbonate, ammonium carbonate, and potassium carbonate, and combinations thereof.

31. The formulation according to claim 27, consisting substantially of said cationic surfactant, said reactive compound, said water-soluble bleaching activator, and said sorbent additive.

32. The formulation according to claim 27 packaged in a kit configuration, wherein said kit configuration comprises:

a premixed first component comprising said cationic surfactant;

a second component comprising said reactive compound; and

a premixed third component comprising said bleaching activator mixed with a sufficient amount of said sorbent additive such that the mixture of bleaching activator plus sorbent additive is a freely flowing powdered substance.

33. The formulation of claim 27, wherein said sorbent additive comprises one or more compounds selected from the group consisting of sodium hexa meta phosphate, sodium ortho phosphate, sodium mono hydrogen ortho phosphate, sodium acid pyro phosphate, sodium tri-polyphosphate, sodium sulfate, sodium carbonate, sodium bicarbonate, calcium meta phosphate, calcium hypo chlorite, calcium chloride, calcium carbonate, potassium bicarbonate, potassium bromide, potassium carbonate, zeolytes, precipitated silicas, percarbonates, sodium citrate, dendritic salt (sea salt), citric acid, potassium bromide, polyethylene glycols, PEG 8000, urea, and polyols, and combinations thereof.

34. The formulation of claim 27, wherein said sorbent additive comprises one or more polyol compounds selected from the group consisting of sorbitol, mannitol, HSH, maltitol, zylitol, lactitol monohydrate, anhydrous isomalt, erythritol, and polydextrose, and combinations thereof.

35. A formulation for use in neutralization of a toxant, said formulation comprising:

at least one solubilizing compound, selected from the group consisting of a cationic hydrotrope and a fatty alcohol comprising from 8 to 20 carbon atoms per molecule;

a reactive compound comprising one or more compounds selected from the group consisting of hydrogen peroxide, urea hydrogen peroxide, hydroperoxycarbonate, peracetic acid, sodium perborate, sodium peroxyphosphate, sodium peroxysilicate, and sodium percarbonate;

a sorbent additive; and

a bleaching activator selected from the group consisting of O-acetyl, N-acetyl, and nitrile group bleaching activators;

wherein said at least one solubilizing compound, said reactive compound, said sorbent additive, and said bleaching activator, when mixed with water and exposed to the toxant, neutralizes the toxant.

36. The formulation according to claim 35 packaged in a kit configuration, wherein said kit configuration comprises:

a premixed first component comprising said at least one solubilizing compound;

a second component comprising said reactive compound; and

a premixed third component comprising said bleaching activator mixed with a sufficient amount of said sorbent additive such that the mixture of bleaching activator plus sorbent additive is a freely flowing powdered substance.

37. The formulation of claim 35, wherein said sorbent additive comprises one or more compounds selected from the group consisting of sodium hexa meta phosphate, sodium ortho phosphate, sodium mono hydrogen ortho phosphate, sodium acid pyro phosphate, sodium tri-polyphosphate, sodium sulfate, sodium carbonate, sodium bicarbonate, calcium meta
5 phosphate, calcium hypo chlorite, calcium chloride, calcium carbonate, potassium bicarbonate, potassium bromide, potassium carbonate, zeolytes, precipitated silicas, percarbonates, sodium citrate, dendritic salt (sea salt), citric acid, potassium bromide, polyethylene glycols, PEG 8000, urea, and polyols, and combinations thereof.
- 10 38. The formulation of claim 35, wherein said sorbent additive comprises one or more polyol compounds selected from the group consisting of sorbitol, mannitol, HSH, maltitol, zylitol, lactitol monohydrate, anhydrous isomalt, erythritol, and polydextrose, and combinations thereof.